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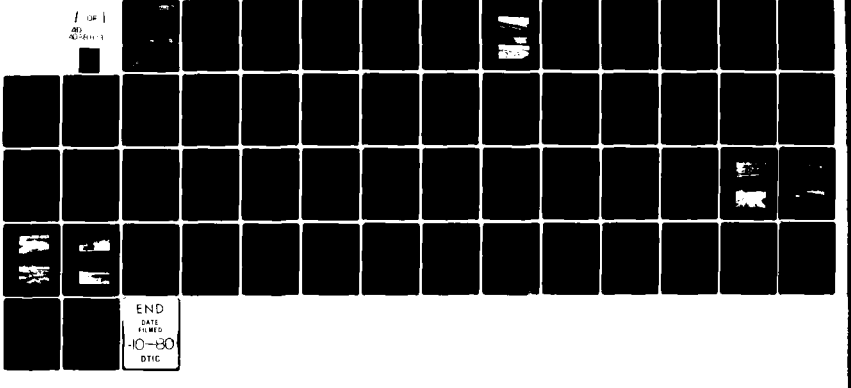

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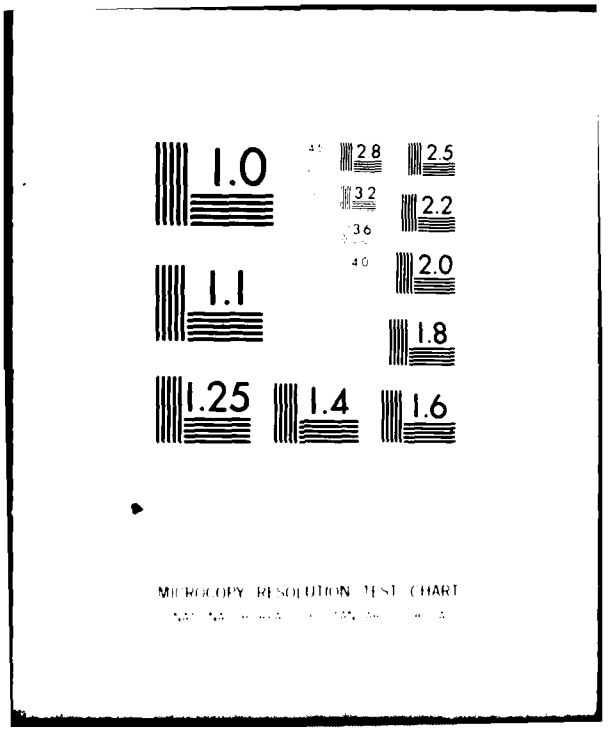
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LEVEL II

BACK RIVER BASIN
HERRING RUN, BALTIMORE CITY

# MARYLAND

# LAKE MONTEBELLO

NDI ID NO. MD-107

## CITY OF BALTIMORE

## PHASE I INSPECTION REPORT
## NATIONAL DAM INSPECTION PROGRAM

New DACW31-80-0050



Prepared For
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

By
RUMMEL, KLEPPER & KAHL
Consulting Engineers
Baltimore, Maryland 21202

JUNE 1980

BACK RIVER BASIN,

HERRING RUN, BALTIMORE CITY,

MARYLAND

LAKE MONTEBELLO

(NDI-ID-MD-107)

DEPARTMENT OF PUBLIC WORKS

PHASE I INSPECTION REPORT,

NATIONAL DAM INSPECTION PROGRAM

Prepared for:
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203



By:
RUMMEL, KLEPPER & KAHL
Consulting Engineers
1035 N. Calvert Street
Baltimore, Maryland 21202

June, 1980

## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The assessment of the conditions and recommendations was made by the consulting engineer in accordance with generally and currently accepted engineering principles and practices.

BACK RIVER BASIN

HERRING RUN, BALTIMORE CITY
MARYLAND

LAKE MONTEBELLO
NDI ID NO. MD-107

CITY OF BALTIMORE
DEPARTMENT OF PUBLIC WORKS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

June, 1980

## CONTENTS



## APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

## BRIEF ASSESSMENT OF GENERAL CONDITION AND RECOMMENDED ACTION

| | |
|---|---|
| Name of Dam: | Lake Montebello<br>NDI ID No. MD-107 |
| Size: | Intermediate (1860 acre-feet, 30 feet high) |
| Hazard Classification: | Significant |
| Owner: | City of Baltimore<br>Department of Public Works<br>600 Municipal Office Building<br>Baltimore, Maryland 21202 |
| State Located: | Maryland |
| City Located: | Baltimore |
| Stream: | Herring Run |
| Date of Inspection: | May 27, 1980 |

Based on the visual inspection, available records, past operational performance, and in accordance with the guidelines criteria established for these studies, Lake Montebello is judged to be in good condition.

The water level in Lake Montebello is normally maintained between elevation 160 and elevation 162 by way of the intermittent operation of a 10-inch gravity connection from the Montebello washwater lake. Other sources of inflow to the lake include:

1. Plant sludges dredged from the washwater lake,
2. Plant sludges from the filtered water reservoirs,
3. Plant sludges from the lime tower (future),
4. Possible surface water runoff from the loop road on the perimeter of the lake, and
5. Rainfall on the lake surface.

Surface water runoff from the drainage areas upstream is intercepted by a major stormdrain system and is directed around the lake by way of the 108-inch Montebello Drain Tunnel which discharges into Herring Run. Therefore, except for Items 4 and 5 previously listed, all inflow into the lake is controlled and flood routing is not required. Although an overflow in the Montebello Gate House limits the theoretical maximum lake water level to elevation 164.3, the lake water levels are actually controlled by limiting inflow from the washwater lake.

It should be noted that at the time of the visual inspection, Lake Montebello had been drained of water except for a relatively small pond remaining in the vicinity of the outlet channel.

No stability problems were evident for the embankment at the time of the visual inspection.

The following remedial measures are recommended to be accomplished by the Owner:

1. Repair minor erosion gullies on the embankment slopes.

2. It appears that, in conjunction with construction in the vicinity of the Montebello Gate House, boulders have been dumped into the outlet channel leading from Lake Montebello. These boulders should be removed prior to refilling of the lake.

3. Remove timbers that are partially blocking the outlet channel inside the Montebello Gate House.

4. Expand the maintenance program so that all features of the dam and controlling gates and valves are inspected frequently and are maintained so as to be operational at all times.

5. Control the brush and shrub growth on the embankment slopes.

6. Develop a formal warning system to alert downstream residents in the event of emergencies.

In addition, the Owner should notify the Baltimore District, Corps of Engineers after the reservoir has been refilled to permit observation of the embankment under normal pool conditions.


Submitted by:

RUMMEL, KLEPPER & KAHL

Edward J. Zeigler, P.E.
Associate

Date: July 7, 1980

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

DATE: 31 July 1980

Downstream Slope

Inside Slope

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE MONTEBELLO
NDI ID NO. MD-107

## SECTION I
## PROJECT INFORMATION

### 1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the dam inspection program is to determine if the dam constitutes a hazard to human life or property.

### 1.2 Description of Project.

a. Dam and Appurtenances. Lake Montebello, completed in 1880, is retained by an earthfill embankment with a puddle clay core. The embankment is approximately 30 feet high at its maximum section and approximately 600 feet long. No internal filter or drainage systems are indicated on the typical section. Except for the 600 foot length of embankment, the remainder of the shoreline of the lake was constructed by excavation into original ground.

Outflow from the reservoir can be accomplished by opening a sluice gate in the Montebello Gate House. A maximum water level of elevation 164.3 is theoretically controlled by means of an overflow within the gate house. Because essentially all significant inflow to the reservoir is controlled by personnel at the Montebello Filtration Plant, detailed hydraulic and hydrologic analyses have not been performed.

The various features of the dam and impoundment are shown on the Photographs in Appendix C and on the Plates in Appendix E. A description of the geology is included in Appendix F.

b. Location. Lake Montebello is located adjacent to Herring Run in Baltimore, Maryland. Lake Montebello is shown on U.S.G.S. Quadrangle, Baltimore East, Maryland, at latitude N39° 20' 00" and longitude W76° 35' 00". A location map is included as Plate E-1.

c. Size Classification, Intermediate (30 feet high, 1,860 acre-feet).

d. Hazard Classification, Significant hazard. Downstream conditions indicate that a significant hazard classification is warranted for Lake Montebello.

e. Ownership. City of Baltimore, Department of Public Works, 600 Municipal Building, Baltimore, Maryland 21202.

f. Purpose of Dam. Aesthetic, interim disposal area for purification plant sludges (originally finished water supply reservoir).

g. Design and Construction History. According to a plaque in the Montebello Gate House, the construction of Lake Montebello and the gate house was completed in 1880. Limited information in the form of a typical section of the embankment and drawings of the Montebello Gate House (Baltimore City File No. 107-B-74-A) is available. No information is available on the construction history of Lake Montebello.

h. Normal Operating Procedure. The pool level in Lake Montebello is normally maintained between elevations 160 and 162 by intermittent operation of a 10-inch gravity connection with the Montebello Washwater lake, which has a normal pool elevation of 196.4. An interconnection does exist between Lake Montebello and the Loch Raven Reservoir by way of a 144-inch gravity tunnel. The operation of a valve in the tunnel, and sluice gates in the Montebello Gate House, would be required to direct Loch Raven Reservoir water into Lake Montebello. This interconnection is no longer used.

Lowering the water level in the impoundment can be accomplished by the manual operation of a sluice gate on a 60-inch brick lined drain in the Montebello Gate House. The 60-inch drain is interconnected with the 108-inch Montebello Drain Tunnel at the gate house, and discharges into Herring Run at a point 2,900 feet downstream from the gate house. The sluice gate was last operated in the summer of 1979 when Lake Montebello was drained to facilitate repair work on the nearby Clifton Conduit.

1.3 Pertinent Data.

a. Drainage Area. Not Applicable.

b. Discharge at Dam Site. Not Applicable.

c. Elevation (Balto. City Datum) (Feet).

| | |
|---|---|
| Top of Dam | 169.9 (low point) |
| Maximum Pool | 164.3 (overflow-gate house) |
| Normal Pool | 160 |
| Upstream Invert outlet works | 134.8 |
| Downstream Invert outlet works | Unknown |
| Streambed at centerline of dam | N/A |
| Maximum Tailwater | Unknown |
| Downstream Toe | 140± |

d. Reservoir Length.

| | |
|---|---|
| Normal Pool Level | 2,800± feet |
| Maximum Pool Level | 2,840± feet |

e. Storage (acre-feet).

| | |
|---|---|
| Normal Pool Level | 1,260 |
| Maximum Pool Level | 1,500 |
| Top of Dam | 1,860 |

f. Reservoir Surface (acres).

| | |
|---|---|
| Normal Pool Level | 55 |
| Maximum Pool Level | 58 |
| Top of Dam | 65. |

g. Dam.

| | |
|---|---|
| Type: | Earth |
| Length: | 600± feet |
| Height: | 30± feet |
| Top Width: | 60 to 70 feet |
| Side Slopes: | Downstream: 1 Vertical to 2 Horizontal |
| | Upstream: 1 Vertical to 4 Horizontal |
| Zoning: | Yes |
| Impervious Core: | Yes |
| Cutoff: | Yes |
| Grout Curtain: | None |

h. Regulating Outlet:

| | |
|---|---|
| Type: | 60-inch brick lined drain |
| Length: | 2,900 feet |
| Closure: | Manually operated sluice gate |
| Access: | Montebello Gate House |
| Regulating Facilities: | Overflow at Gate House |

i. Spillway. Not Applicable

## SECTION 2
## DESIGN DATA

### 2.1 Design.

a. Data Available. With the exception of limited design architectural drawings of the Montebello Gate House, the 108-inch Montebello Drain Tunnel, and a typical section of the embankment obtained from the City of Baltimore, there is no data available concerning the design or construction of Lake Montebello.

(1) Hydrology and Hydraulics. No hydrology and hydraulic analyses are available. The records include a "Storage Capacity vs. Elevation" curve for Lake Montebello.

(2) Embankment. A typical section of the embankment indicating a puddle core and cutoff is available and is included as Plate E-2.

(3) Appurtenant Structures. A limited number of drawings are available for the Montebello Gate House and the 108-inch Montebello Drain Tunnel.

b. Design Features.

(1) Embankment. Examination of photogrammetry and visual inspection of surrounding topography indicates that an earth embankment approximately 600 feet long and 30 feet high was constructed across a low area to form the closure for the eastern end of Lake Montebello. The typical section indicates the embankment was constructed with a crest width of 80 feet, and has a puddle core and cutoff trench.

(2) Appurtenant Structures. The appurtenant structure for the dam consists of the Montebello Gate House and the 108-inch Montebello Drain Tunnel. Limited information in the form of architectural renderings is available, however specific design information could not be located by the City of Baltimore.

c. Design Data.

(1) Hydrology and Hydraulics. No design data is available. A tabulation of reservoir storage capacity vs. elevation has been derived from a curve dated 2/14/28 obtained from the City of Baltimore and included in Appendix D.

(2) Embankment. No design information is available for the construction of the dam, however a typical section of the embankment has been obtained and is included in Appendix E.

2.2 Construction. No data is available on the construction of the dam.

2.3 Operation, No formal operating records are available for the dam. According to discussions with Baltimore City personnel, the lake level was lowered in 1979 by opening the sluice gate in the Montebello Gate House. Inflow into the lake is controlled by gravity feed through a 10-inch line from the Montebello Wash Water Lake.

2.4 Other Investigations. None reported.

2.5 Evaluation.

a. Availability. Design information on the dam at Lake Montebello is limited to a typical section of the embankment.

b. Adequacy. The available information includes no data which would allow the technical assessment of the embankment. Therefore, the available data is not considered sufficient to evaluate the design and construction of the dam.

## SECTION 3
## VISUAL INSPECTION

### 3.1 Findings.

a. General. The on-site inspection of Lake Montebello consisted of:

(1) Visual inspection of the embankment, abutments, and embankment toe.

(2) Visual examination of the appurtenant structures.

(3) Evaluation of the downstream area hazard potential.

The specific observations are shown on Plate A-1.

b. Embankment. The general inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features. No evidence of any structural distress was observed during the visual inspection. However, at the time of the inspection, the lake had been drained except for a small pond remaining in the vicinity of the outlet channel.

The crest of the dam was surveyed and was found to vary in elevation by approximately 6 inches. Freeboard at the time of the inspection was approximately 25 feet (lowered lake level), and under maximum pool conditions would be approximately 6 feet. The dam crest profile is included as Plate E-4.

c. Appurtenant Structures. With the exception of large boulders partially blocking the entrance of the outlet channel leading from Lake Montebello to the Montebello Gate House, and timbers partially blocking the outlet inside the gate house, the appurtenant structures were found to be in good condition. It appears that the large boulders in the entrance channel are related to construction now underway in the vicinity of the Montebello Gate House. No inspection was made of the 108-inch Montebello Drain Tunnel.

d. Reservoir Area. With the exception of rain falling directly on the lake and possibly some runoff from the peripheral roadway, all runoff from the adjacent drainage area is intercepted by major Baltimore City storm drainage systems and diverted around Lake Montebello by the 108-inch Montebello Drain Tunnel.

e. Downstream Channel. The channel downstream from the embankment consists of the floodplain of Herring Run. Except for bridge structures crossing Herring Run, there are no residences or structures within the floodplain. However, because

of the bridge structures and playing fields downstream of the embankment, a significant hazard classification is warranted for Lake Montebello.

3.2 Evaluation. The visual examination and observations of Lake Montebello indicate that except for the debris partially blocking the outlet channel, the embankment and appurtenant structures are in good condition. Further investigations are not considered necessary at this time.

## SECTION 4
## OPERATIONAL FEATURES

4.1 Procedure. There are no formal operating procedures for the dam. The reservoir level is normally maintained at elevations between 160 and 162, from 4.3 to 2.3 feet below the Gate House overflow elevation of 164.3, by introducing water by gravity feed from the Montebello washwater Lake as necessary.

4.2 Maintenance of the Dam. The maintenance of the dam is considered good. The crest of the dam carries the peripheral roadway which is maintained by the City of Baltimore. The downstream face is grassed, and also contains shrubs and brush.

4.3 Maintenance of Operating Facilities. The operation of the outlet sluice gate was last accomplished in 1979, when the reservoir level was lowered to permit work on an adjacent conduit. The inlet from the washwater lake is operated on an as-needed basis.

4.4 Warning System. No formal warning system exists for the dam. Telephone communication facilities are available from the water treatment plant above Lake Montebello.

4.5 Evaluation. The maintenance of the dam and the operating facilities are considered good. It is recommended that the Owner remove the debris that partially blocks the outlet channel at the gate house before the impoundment is refilled with water.

## SECTION 5
## HYDRAULICS AND HYDROLOGY

### 5.1 Evaluation of Features.

a. Design Data. Original design data for the hydraulics and hydrology of Lake Montebello are not available. A photocopy of "Storage Capacity vs. Elevation" curve for Lake Montebello dated 2/14/28 has been obtained from the City of Baltimore. A tabulation of reservoir storage versus pool elevation is included as Page D-2 of Appendix D.

Because all inflow with the exception of runoff from the perimeter road and rainfall on the surface of the lake is controlled, hydraulic and hydrologic analyses have not been performed for Lake Montebello. The hazard classification for this intermediate impoundment is considered significant.

b. Experience Data. No records are available on reservoir levels, however, the elevation of the lake is periodically measured from the Montebello Gate House floor. There is no information that would indicate there has ever been a problem with Lake Montebello storing or passing rainfall and runoff from severe storms including hurricanes and tropical disturbances.

c. Visual Observations. Visual examination of the embankment, appurtenant structures, and downstream floodplain indicate that there are no problems with the hydraulic and hydrologic aspects of Lake Montebello. It is recommended that the boulders and timbers partially blocking the outlet channel at the gate house be removed before the impoundment is refilled with water.

d. Overtopping Potential. Because all flow into the lake is controlled, with the exception of minor runoff and rainfall on the lake, there is no evidence that potential overtopping is a problem. No evidence exists that Lake Montebello has ever overtopped or been in danger of overtopping.

e. Spillway Adequacy. The existing effluent pipe and overflow at the Montebello Gate House are considered adequate for the manner in which Lake Montebello is operated.

## SECTION 6
## STRUCTURAL STABILITY

### 6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) Embankment. Visual examination of the dam embankment indicates that there are no wet spots, seepage, slumps, or other features that suggest embankment instability; minor erosion gullies were noted on the embankment. However, at the time of the inspection, the lake had been drained except for a small pond remaining in the vicinity of the outlet channel.

(2) Appurtenant Structures. The appurtenant structures consisting of the gate house and outlet tunnel and valves show no signs of distress.

b. Design and Construction Data.

(1) Embankment. Limited information on the typical section of the embankment is available, however no stability analyses or construction data were located. There is no evidence that the embankment was not designed and constructed in accordance with the accepted procedures of the time, and the embankment has performed in a satisfactory manner for approximately 100 years with no evidence of distress.

(2) Appurtenant Structures. Limited information consisting of architectural renderings are available for the Montebello Gate House and the 108-inch Montebello Drain Tunnel. No design calculations or construction records are available.

c. Operating Records. No formal operating records are maintained. The water level in Lake Montebello is controlled by inflow or outflow on an as needed basis.

d. Post Construction Changes. No records of post construction changes involving the embankment or appurtenant structures have been located. Records are available showing modifications to the 108-inch Montebello Drain Tunnel.

e. Seismic Stability. Lake Montebello is located in Seismic Zone 1, and therefore is assumed to present no hazard from an earthquake standpoint.

## SECTION 7
## ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

### 7.1 Dam Assessment.

a. Assessment. Lake Montebello is an intermediate storage, significant hazard impoundment. The visual inspection of the embankment, appurtenant structures, and downstream area indicates that the impoundment poses no threat to life or property. Because essentially all inflow into the lake can be controlled, the hydraulic and hydrologic aspects of the project are not significant.

b. Adequacy of Information. The available information on the design and construction of Lake Montebello is extremely limited. Because of the way the water levels are controlled, and the fact that essentially no runoff enters the impoundment, the available information is considered adequate for the Phase I report.

c. Urgency. Although there is no urgency in instituting the remedial measures recommended below, the measures should be accomplished in a timely manner.

d. Need for Additional Data. At the present time, there is no need to obtain additional data or conduct additional investigations at Lake Montebello. Should the City of Baltimore locate additional information on design and construction in the future, it would be interesting from an historical engineering standpoint to review the data.

### 7.2 Recommendations/Remedial Measures.

The following remedial measures are recommended to be accomplished by the Owner:

a. Repair minor erosion gullies on the embankment slopes.

b. It appears that, in conjunction with construction in the vicinity of the Montebello Gate House, boulders have been dumped into the outlet channel leading from Lake Montebello. These boulders should be removed prior to refilling of the lake.

c. Remove timbers that are partially blocking the outlet channel inside the Montebello Gate House.

d. Expand the maintenance program so that all features of the dam and controlling gates and valves are inspected frequently and are maintained so as to be operational at all times.

e. Control the brush and shrub growth on the embankment slopes.

f. Develop a formal warning system to alert downstream residents in the event of emergencies.

In addition, the Owner should notify the Baltimore District, Corps of Engineers after the reservoir has been refilled to permit observation of the embankment under normal pool conditions.

# APPENDIX A

# VISUAL INSPECTION CHECKLIST

# PHASE I

## APPENDIX A
## VISUAL INSPECTION CHECKLIST
## PHASE I

Name of Dam: Lake Montebello County (or City): Baltimore City State: Maryland

NDI ID. No.: MD-107 Type of Dam: Earthfill Hazard Category: Significant

Date(s) Inspection: May 27, 1980 Weather: Clear Temperature: 70's

Pool Elevation at Time of Inspection: N/A* M.S.L. Tailwater at Time of Insp. N/A M.S.L.

*Lake drained

| Inspection Personnel: | Review Inspection Personnel: |
|---|---|
| J. D. Nauman | E. J. Zeigler |
| A. Zamboky | J. G. Mintiens |
| | J. D. Nauman |

J. D. Nauman Recorder

VISUAL INSPECTION
PHASE I
EMBANKMENT

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SURFACE CRACKS | None | |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | None | |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | Two small erosion gullies noted. | |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST | Vertical alignment varies by 6 inches. Horizontal alignment satisfactory | |
| RIPRAP FAILURES | None | |

VISUAL INSPECTION
PHASE I
EMBANKMENT

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM | Satisfactory | |
| ANY NOTICEABLE SEEPAGE | None | |
| STAFF GAGE AND RECORDER | None | |
| DRAINS | No drains in embankment. original cross-section shows 8 foot brick Clifton Conduit paralleling embankment crest under downstream portion. | |
| | | |

VISUAL INSPECTION
PHASE I
OUTLET WORKS

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT | Montebello Drain Tunnel not observed | |
| INTAKE STRUCTURE | N/A | |
| OUTLET STRUCTURE | Outlet leading from the lake to the gate house partially blocked by boulders. within gate house, outlet partially blocked by timbers | Remove boulders from outlet entrance and remove timber inside gate house prior to refilling lake |
| OUTLET CHANNEL | Montebello Drain Tunnel, partially submerged and not inspected. Tunnel outlet free of debris. | |
| EMERGENCY GATE | Sluice gate in Montebello Gate House, last operated in 1979 | Scheduled maintenance should be performed on the sluice gate |

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CONCRETE WEIR | N/A | |
| APPROACH CHANNEL | N/A | |
| DISCHARGE CHANNEL | N/A | |
| BRIDGE AND PIERS | N/A | |
| | | |

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

| VISUAL EXAMINATION | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CONCRETE SILL | N/A | |
| APPROACH CHANNEL | N/A | |
| DISCHARGE CHANNEL | N/A | |
| BRIDGE PIERS | N/A | |
| GATES AND OPERATION EQUIPMENT | N/A | |

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

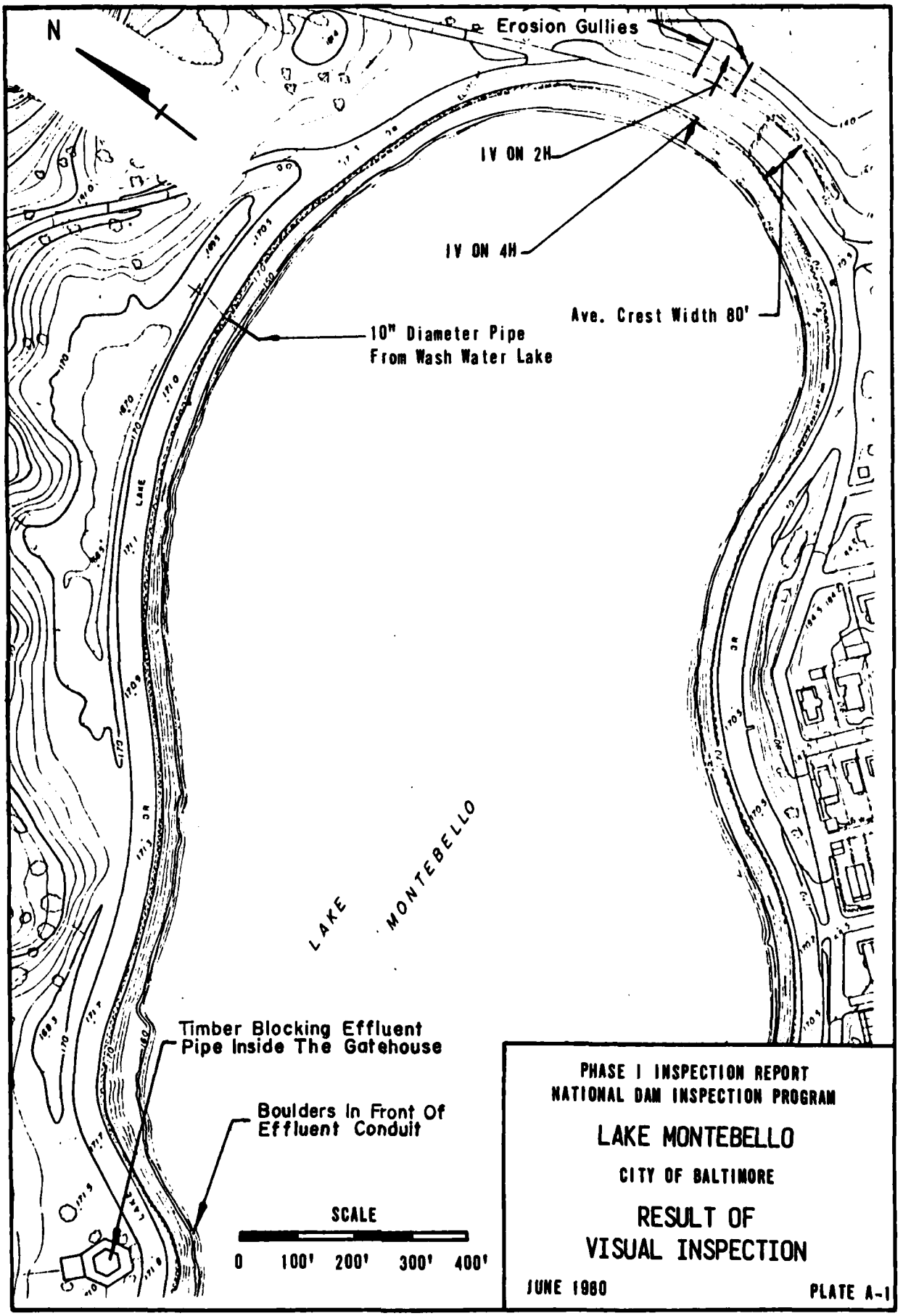
| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| MONUMENTATION/SURVEYS | None | |
| OBSERVATION WELLS | None | |
| WEIRS | None | |
| PIEZOMETERS | None | |
| OTHER | None | |

VISUAL INSPECTION
PHASE I
RESERVOIR

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SLOPES | Upper 5 to 10 feet of inner slope vegetated. Small riprap loosely placed between elevations 155± and 165± | |
| SEDIMENTATION | Water purification plant sludge pumped from wash water lake into Lake Montebello | |
| UPSTREAM RESERVOIRS | Interconnection with Loch Raven Reservoir via 144-inch tunnel, No longer used. | |
| | | |
| | | |

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CONDITION (OBSTRUCTIONS, DEBRIS, ETC.) | N/A | |
| SLOPES | N/A | |
| APPROXIMATE NUMBER OF HOMES AND POPULATION | Should embankment Fail, water would Flow into Herring Run (wide, undeveloped Floodplain) | |
| | | |
| | | |




PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

# LAKE MONTEBELLO

CITY OF BALTIMORE

## RESULT OF VISUAL INSPECTION

JUNE 1980

PLATE A-1

# APPENDIX B

# ENGINEERING DATA CHECKLIST

# PHASE I

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Lake Montebello

ID# NDI ID No. Md-107

| ITEM | REMARKS |
|---|---|
| AS-BUILT DRAWINGS | Gate House drawings available (Baltimore City File No. 107-B-74-A) Contract Drawings of the Montebello Drain Tunnel are available As built drawings of the reservoir are not available. |
| REGIONAL VICINITY MAP | Lake Montebello is shown on essentially all maps of Baltimore City. |
| CONSTRUCTION HISTORY | A plaque in the Montebello Gate House indicates that the Gate House and reservoir was completed in 1880. Other information not available. |
| TYPICAL SECTIONS OF DAM | A typical section of the embankment has been obtained From Baltimore City and is included as Plate E-2. |
| OUTLETS - PLAN<br>- DETAILS<br>- CONSTRAINTS<br>- DISCHARGE RATINGS | A plan and some details of the Montebello Drain Tunnel are available. |

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

| ITEM | REMARKS |
|---|---|
| RAINFALL/RESERVOIR RECORDS | Not Applicable |
| DESIGN REPORTS | UnKnown |
| GEOLOGY REPORTS | Geologic quadrangle mapping dated 1979 is available from the Maryland Geological Survey and is included in Appendix F. |
| DESIGN COMPUTATIONS<br>HYDROLOGY & HYDRAULICS<br>DAM STABILITY<br>SEEPAGE STUDIES | Not Available |
| MATERIALS INVESTIGATIONS<br>BORING RECORDS<br>LABORATORY<br>FIELD | UnKnown |

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

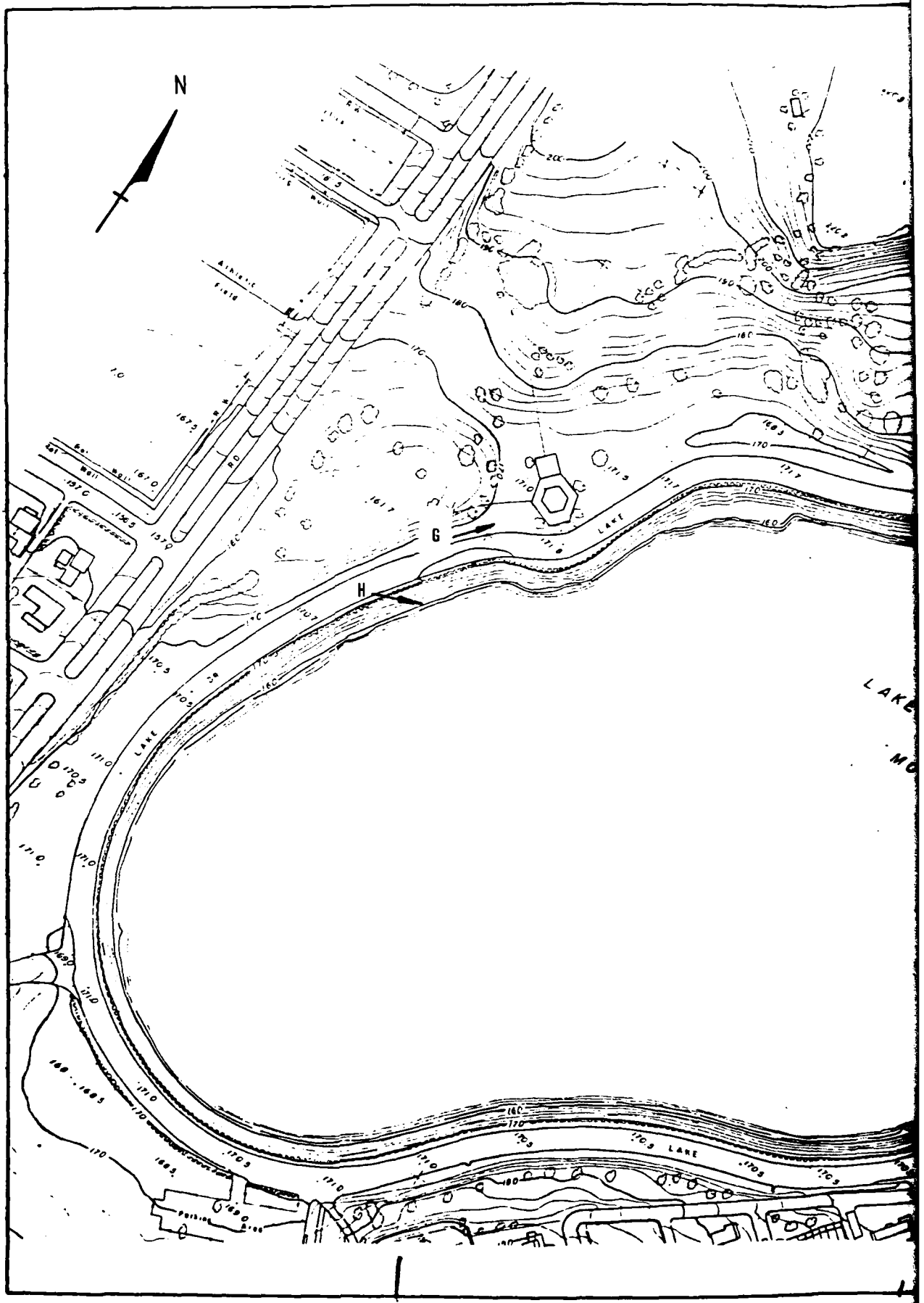
| ITEM | REMARKS |
|---|---|
| POST CONSTRUCTION SURVEYS OF DAM | Not Available |
| BORROW SOURCES | Unknown |
| MONITORING SYSTEMS | None |
| MODIFICATIONS | Montebello Drain Tunnel was rehabilitated in 1959. |
| HIGH POOL RECORDS | Not recorded |

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

| ITEM | REMARKS |
|---|---|
| POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS | None reported |
| PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS | None reported |
| MAINTENANCE OPERATION RECORDS | None |
| SPILLWAY PLAN<br>SECTIONS<br>DETAILS | Not Applicable |
| OPERATING EQUIPMENT PLANS AND DETAILS | Limited information is available on Montebello Gate House drawings |

# APPENDIX C

# PHOTOGRAPHS


N
G
H
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LAKE

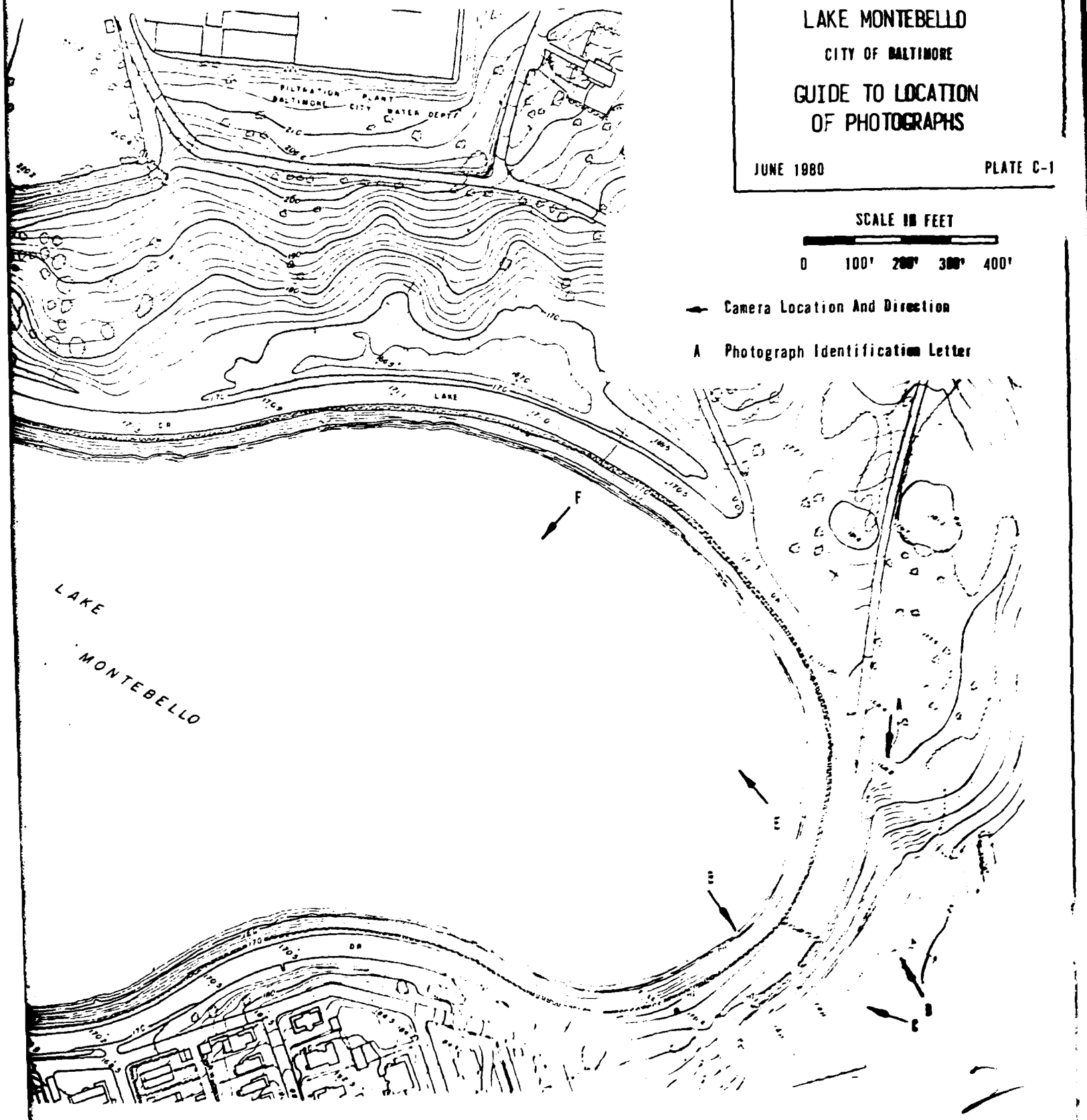
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

# LAKE MONTEBELLO

CITY OF BALTIMORE

## GUIDE TO LOCATION OF PHOTOGRAPHS

JUNE 1980 PLATE C-1



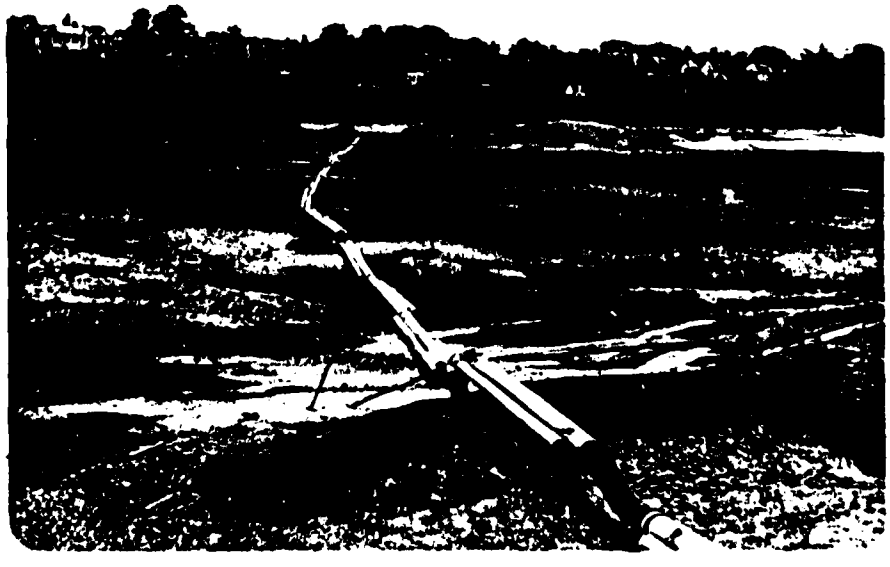
A. Crest and North Side of Eastern Embankment

B. Upstream Slope of Eastern Embankment

C. Downstream Embankment - Southern Half

D. Downstream Embankment - Northern Half

E. Eastern Half of Reservoir is Dry.



F. 10 Inch Diameter Pipe from Wash Water Lake.

G. Lake Montebello Gate House

H. Water Impounded in Western Half of Reservoir

# APPENDIX D

# HYDROLOGY AND HYDRAULICS

EVALUATION OF AFFECTS OF
MAXIMUM PROBABLE PRECIPITATION
UPON RESERVOIR WATER SURFACE

Name of Dam: Lake Montebello (NDI-107)

Drainage Area: (Lake Surface Area at Maximum Pool) = 0.091 sq. miles

Unadjusted Probable Maximum Precipitation (PMP) = 24.2 inches/24 hrs. for 200 square miles

Adjusted PMP for Shape Factor for 200 square miles = 24.2 inches/24 hrs. x .80 = 19.4 inches/24 hours[1,2]

Adjusted PMP for Drainage Area = 19.4 x 123% = 23.9 inches/24 hours[1] for 10 square miles

(Note: PMP curves from Hydrometeorological Report 33 do not extend beyond drainage of less than 10 square miles. While the lake surface area is substantially less than this value, no extension of the published curves has been attempted.)

Maximum Pool Elevation = 164.3 feet above m.s.l.

Pool Elevation Following Occurrence of PMP of 24 hour Duration = 164.3 + 2.0 feet = 166.3 feet above m.s.l.

(Note: Design data for Montebello Gate House overflow structure capacity is not available. Pool elevation derived above conservatively assumes that overflow structure is not functioning during occurrence of PMP.)

Top of Dam Elevation = 169.9 feet above m.s.l. (low point on crest)

Remaining Freeboard = 169.9 - 166.3
= 3.6 feet

Conclusion: Dam would not be overtopped following storm having an intensity equal to PMP derived above.

[1] Hydrometeorological Report 33, U.S. Army, Corps of Engineers, 1956.
[2] Engineering Circular 1110-2-27, U. S. Army, Corps of Engineers, August, 1966.

## Tabulation of Reservoir Storage Capacity Vs. Pool Elevation[1]

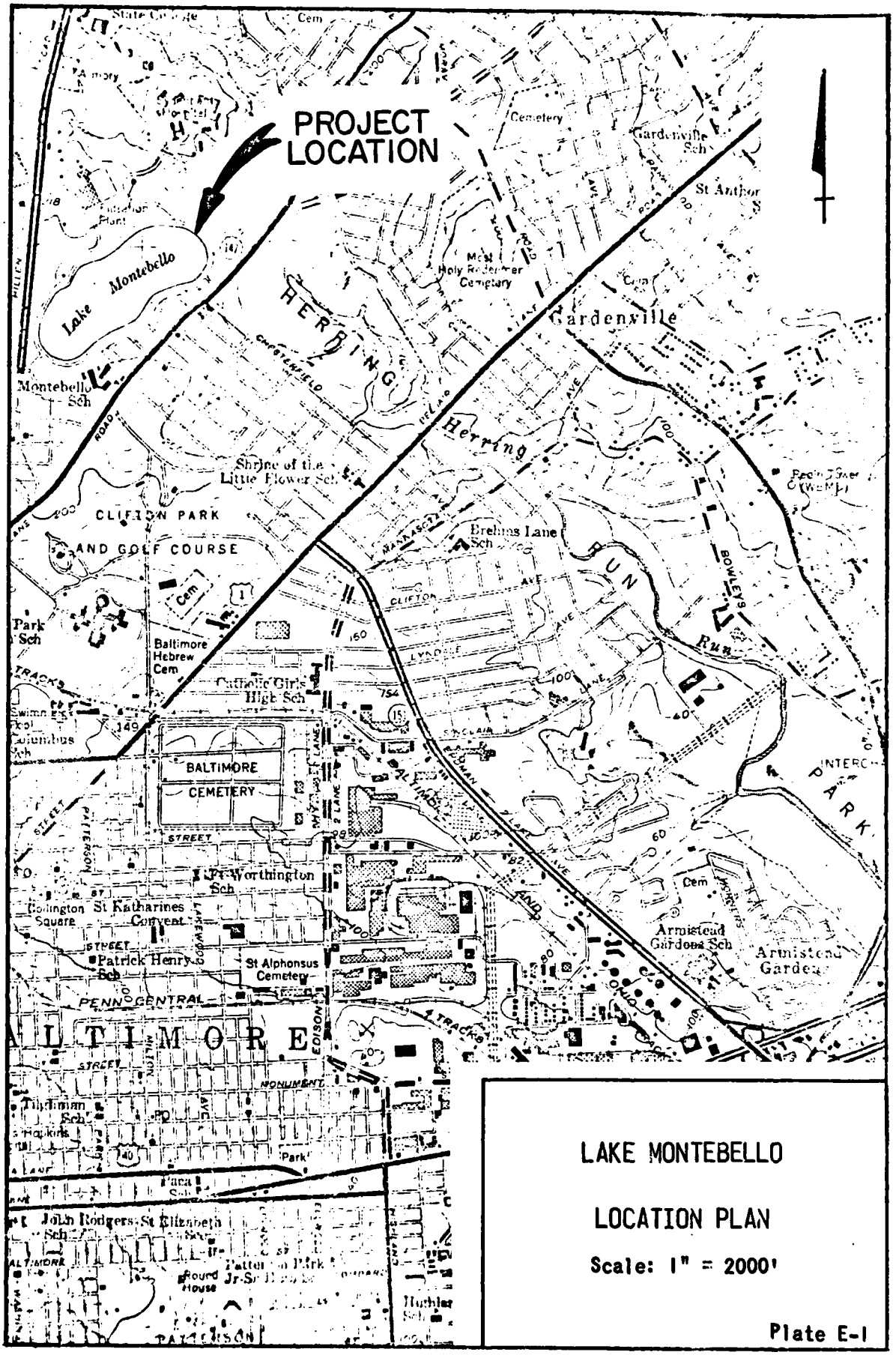
Name of Dam: Lake Montebello (NDI-107)

| Pool Elevation feet above m.s.l.[2] | Surface Area acres | Reservoir Storage acre-feet |
|---|---|---|
| 134.8 (Invert Effluent Gates at Montebellow Gate House) | - | 0 |
| 135 | - | 10 |
| 140 | - | 240 |
| 145 | - | 470 |
| 150 | - | 730 |
| 155 | - | 980 |
| 160 | - | 1260 |
| 164.3 (Maximum Pool) | 58[3] | 1500 |
| 169.9 (Top of Dam) | 65[3] | 1860[4] |

[1] Source: Lake Montebello Capacity Curve, City of Baltimore, Department of Public Works, Bureau of Water Supply, February 14, 1928.
[2] Baltimore Topographical Survey Datum
[3] Area planimetered from a reduction of Baltimore City 100-scale photogrammetric mapping.
[4] Computed by Rummel, Klepper & Kahl

# APPENDIX E

# PLATES

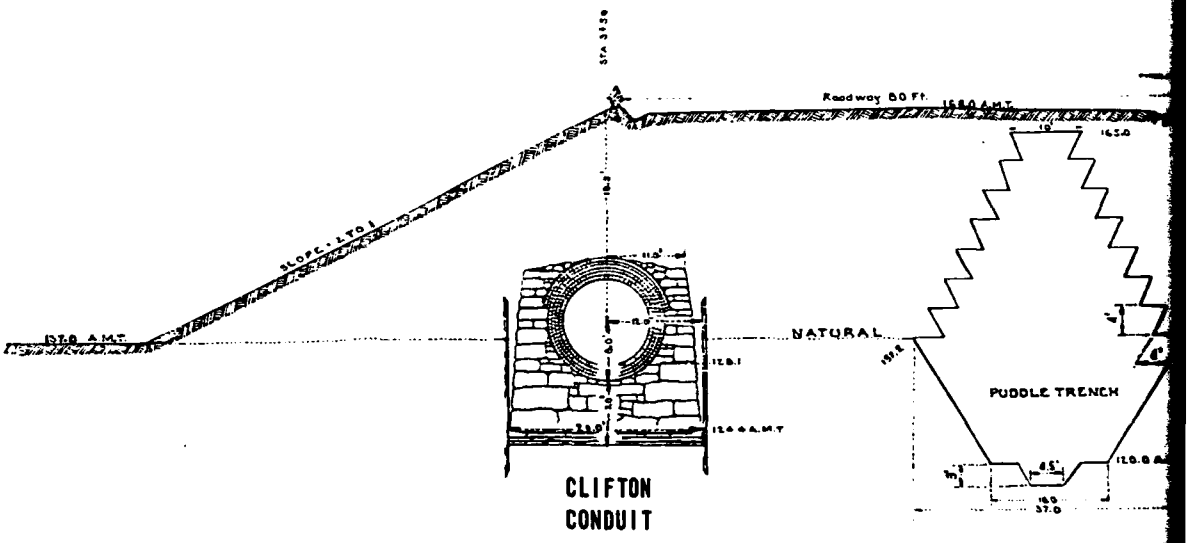



LAKE MONTEBELLO

LOCATION PLAN

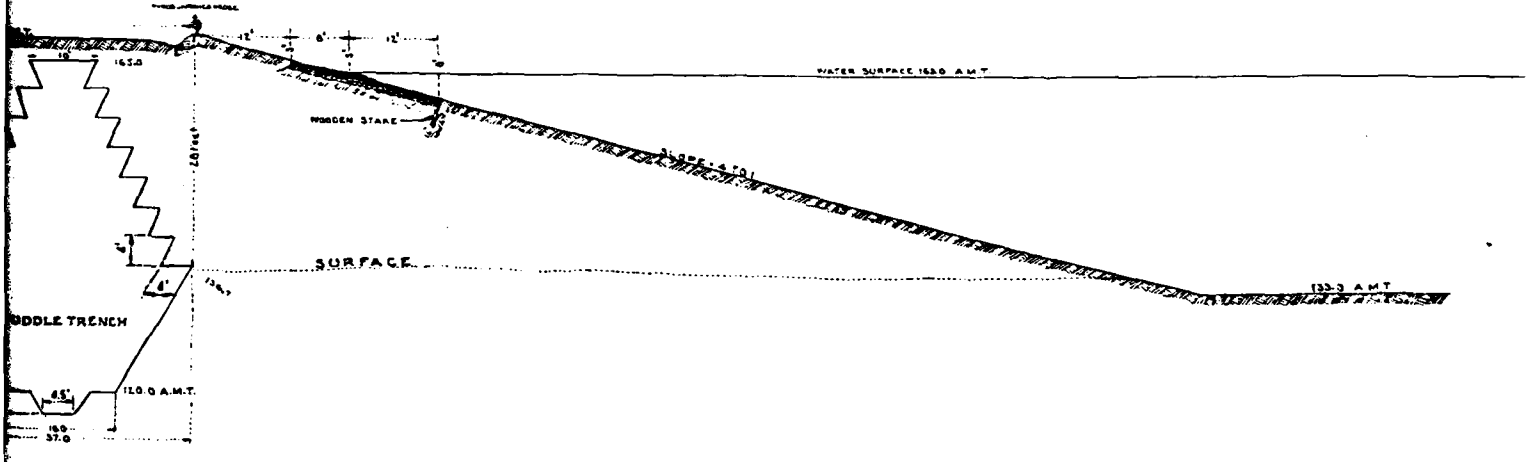
Scale: 1" = 2000'

Plate E-1




CLIFTON
CONDUIT

SCALE: 1" = 24'




LE: 1" = 24'

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

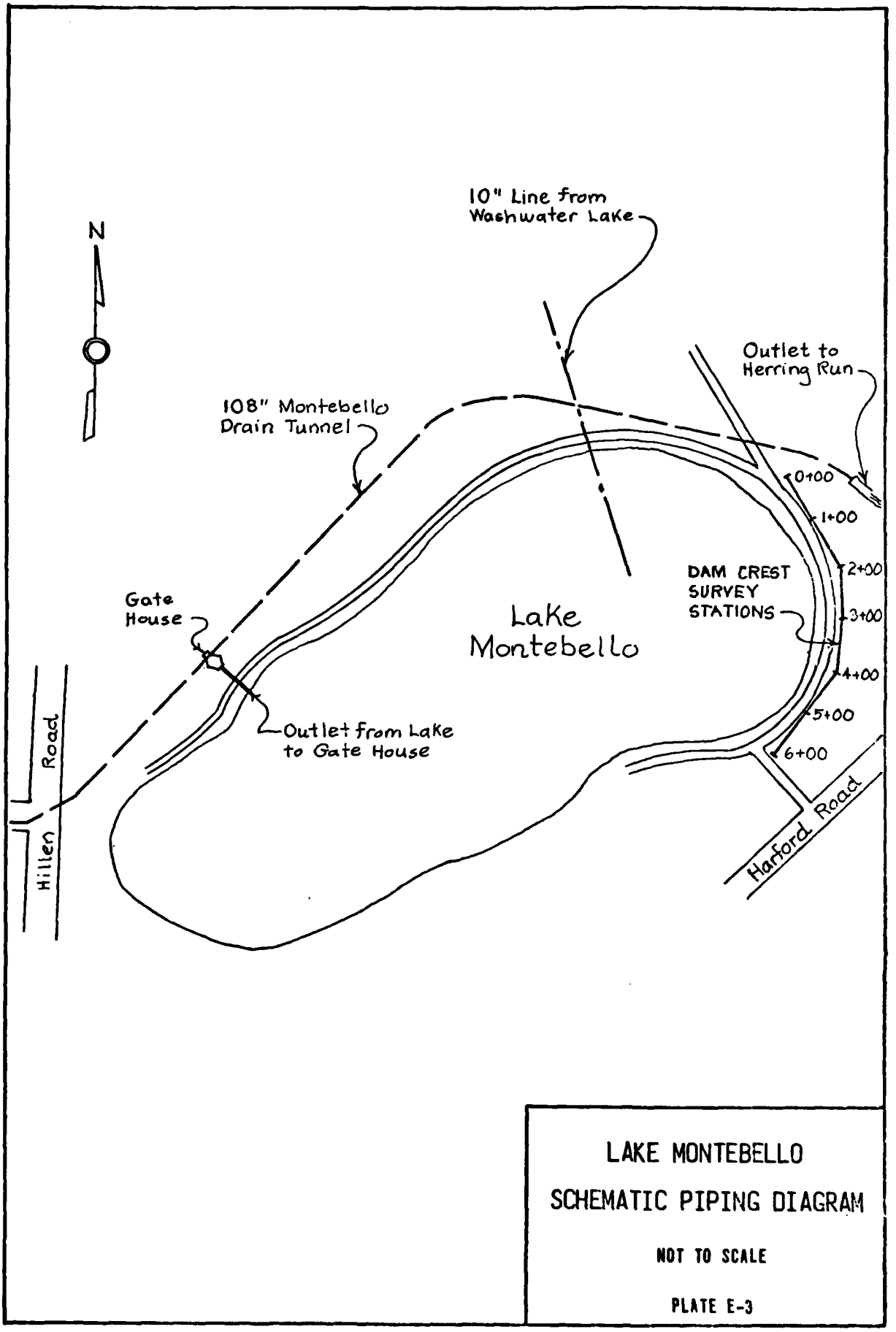
LAKE MONTEBELLO

CITY OF BALTIMORE

TYPICAL SECTION
OF EMBANKMENT

JUNE 1980

PLATE E-2

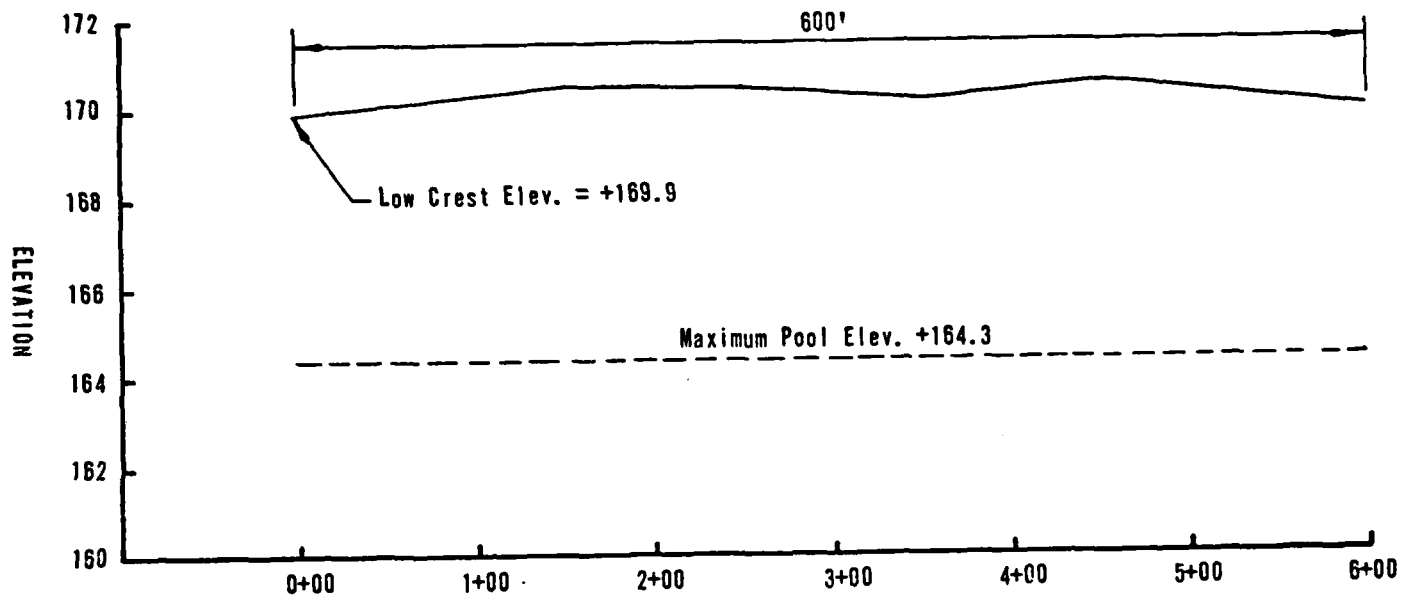



LAKE MONTEBELLO

SCHEMATIC PIPING DIAGRAM

NOT TO SCALE

PLATE E-3




DAM CREST PROFILE

(LOOKING DOWNSTREAM)

Note: Dam Crest Survey Stations
Are Shown On Plate E-3

Datum Elevation Is Interpolated From 100 Scale Photogrammetry Obtained From The City Of Baltimore

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE MONTEBELLO

CITY OF BALTIMORE

DAM CREST SURVEY

JUNE 1980

PLATE E-4

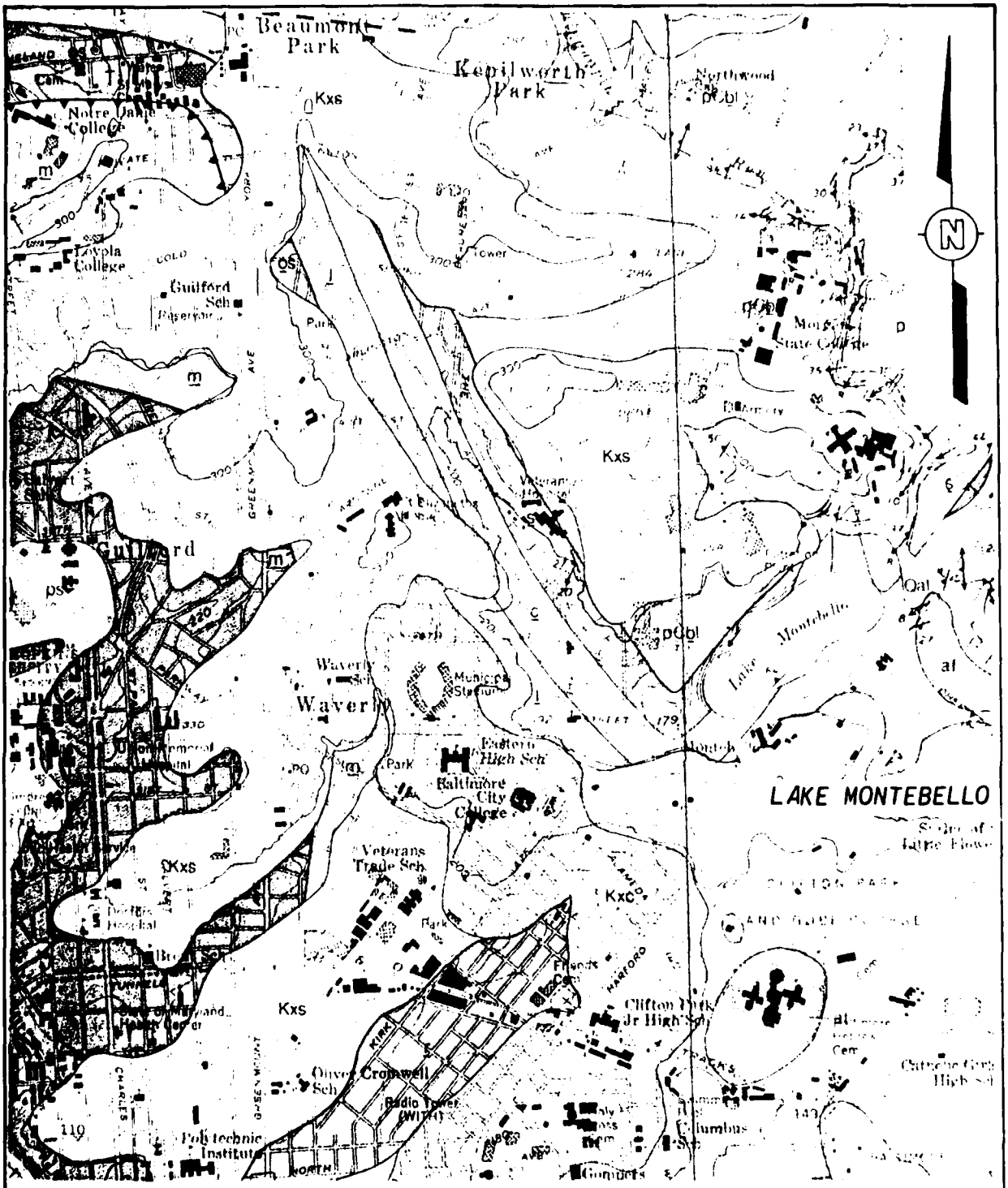
# APPENDIX F

# GEOLOGY

## LAKE MONTEBELLO

### GEOLOGY

Lake Montebello is located in the Eastern Division of the Piedmont Physiographic Province. The Piedmont Province is characteristically underlain by a complex series of metamorphosed sedimentary and igneous rocks. Lake Montebello is underlain by the Loch Raven Schist, the Cockeysville Marble, and the Setters Quartzite. The Cockeysville Marble crops out along the southeastern shore of the impoundment and can be observed during periods of low water levels.. The Setters Quartizite crops out just northeast of the lake.




SCALE

1000' 0 1000' 2000' 3000' 4000'

**REFERENCE:**

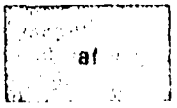
GEOLOGIC MAP OF THE BALTIMORE EAST QUADRANGLE, PREPARED BY STATE OF MARYLAND, MARYLAND GEOLOGICAL SURVEY, DATED 1979, SCALE 1" = 2000'

LAKE MONTEBELLO

GEOLOGY MAP

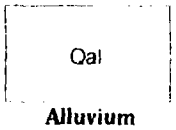
RUMMEL, KLEPPER & KAHL

# LEGEND



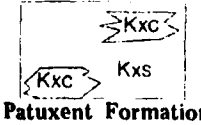

## Artificial Fill

*Consists of heterogeneous materials such as rock, unconsolidated sediment, slag, refuse, and dredge spoil. Only major areas of filled or highly disturbed ground have been mapped, such as refilled pits, diked flood plains and transportation corridors across topographically low areas. Thickness 3 to 5 m (10 to 15 ft)*




## Alluvium

*Interbedded gravel, sand, silt, and clay of varied composition and sorting. Typically confined to flood plains of perennial streams, upland gathering areas and marshes adjacent to estuaries. Sediment size, sorting, and mineralogy are strongly controlled by the source rocks and geomorphic setting. The quartzose sands and polymict gravels are typically well bedded and loosely compacted, the silts and clays are often water saturated and poorly bedded. Minor amounts of colluvium (unmapped) may interfinger with alluvium at or near the bases of slopes. Structural symbols on alluvium represent bedrock exposures in stream valleys. These are typically either along the margins of the flood plain or close to the main channel of the drainage. Thickness 0.5 to 5 m (2 to 15 ft)*




## Patuxent Formation

Kxs *Sand facies. Highly variable interbedded sand, gravel, silt, and clay containing ferruginous cements. Sand and gravel typically quartzose with a buff, kaolinitic clay silt matrix. Sediments are organized into fining upward packages 3 to 5 m (10 to 15 ft) thick consisting of planar bedded gravel with clay clasts or cross bedded sands at the base grading upward to laminated or massive silt-clay at the top. Elsewhere vertical sequences show abrupt sediment size changes and erosive contacts. The heavy mineral suite is characterized by staurolite, zircon, tourmaline, and kyanite. Sparse silicified and abundant iron oxide replacements of both cycadioids and coniferous wood are present throughout the Formation. These sediments were deposited in a high-gradient, braided stream complex*

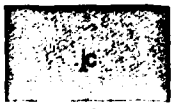
Kxc *Clay facies. Light gray to black or brown clay containing variable amounts of quartz silt and gravel, local concentrations of lignitic partially pyritized wood or macerated leaf and cone debris are associated with some siderite concretions. Thin planar beds of sand and/or gravelly clay are interbedded with massive clays. These isolated clay pods are thought to be accumulations on deflated surfaces such as abandoned stream channels or pre Cretaceous topographic lows*

*Thickness 2 to 35 m (7 to 115 ft).*

(P.

## Potomac Group (?)

*These unconsolidated to locally iron oxide cemented sediments are lithologically similar to Patuxent Formation sand units mapped elsewhere. Sediment caps composed of such materials are distributed discontinuously west of the intact Coastal Plain sequence and have not yielded palynomorphs for biostratigraphic control. Compositionally these are poorly to well sorted quartz sands containing variable amounts of vein quartz gravel. Variable amounts of silt and clay are concentrated in lenses or pods or disseminated as matrix. Thickness 0.5 to 10 m (2 to 30 ft).*




## James Run Formation (Carroll Gneiss Member)

*Fine to medium grained, generally layered biotite quartz plagioclase gneiss locally with muscovite. Mica absent and magnetite present in some outcrops. Includes subordinate concordant plagioclase hornblende gneiss (amphibolite) in layers generally a few centimeters to a few decimeters thick, but locally as much as several meters thick. Concordia plot yields age of 550 million years*


## Mount Washington Amphibolite

*Chiefly uniform, medium to coarse grained amphibolite consisting of plagioclase plus actinolite and/or hornblende. Includes minor massive actinolite rock (actinofels)*

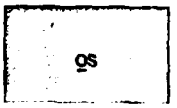
**REFERENCE:**

GEOLOGIC MAP OF THE BALTIMORE EAST QUADRANGLE, PREPARED BY STATE OF MARYLAND, MARYLAND GEOLOGICAL SURVEY, DATED 1979

GEOLOGY MAP LEGEND

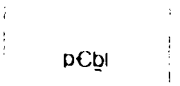
RUMMEL, KLEPPER & KAHL

# LEGEND




## Oella Formation (Sweathouse Amphibolite Member)

*Fine- to medium-grained, very well foliated plagioclase-hornblende gneiss (amphibolite) commonly with epidote and quartz. Generally thinly layered on a scale of centimeters due to variations in the ratio of dark to light minerals. Includes minor mica-quartz schist and gneiss.*



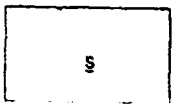

## Baltimore Gneiss (layered gneiss member)

*Generally medium-grained biotite-quartz-plagioclase-microcline gneiss with a conspicuously variable biotite content such that outcrops typically have a layered appearance. Contacts vary from sharp to gradational and may separate layers more than a meter thick, laminae or veins a centimeter or so thick, or lenses of one rock type enclosed by another. Locally the concentration of biotite in the rock is so great as to constitute a schist. Local textural variations include the development of pegmatitic texture and the rare occurrence of feldspar augen. Most outcrops show abundant small-scale folds. Dated radiometrically at 1,000 to 1,300 million years.*


## Loch Raven Schist

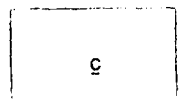
*Uniform, medium-grained biotite-plagioclase-muscovite-quartz schist containing, in places, tiny tourmaline prisms, and pegmatitic clots consisting largely of feldspar and tourmaline. Locally very feldspathic. Includes a single, thin, unmapped layer of amphibolite along Herring Run near the top of the formation. Correlative rocks collected from the Montebello aqueduct north of the Municipal Stadium contain garnet.*

*Rush Brook Member. Fine-, medium-, and coarse-grained biotite-feldspar-muscovite-quartz schist and medium-grained muscovite-microcline-quartzite interlayered on a scale of tens of centimeters to meters. May include subordinate Gunpowder Gneiss as intrusive sills.*



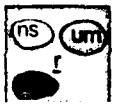

## Setters Formation (undivided)

*Slabby weathering, medium-grained, thin-bedded muscovite-microcline quartzite with tourmaline. Crops out only northeast of Lake Montebello and along Loch Raven Boulevard near the Veterans Hospital. Its presence elsewhere is inferred on the basis of topography, extrapolation from outcrops in the adjacent Baltimore West quadrangle, and its known occurrence in the Montebello aqueduct where it includes feldspar-mica-quartz schist and mica quartzite, both locally with tourmaline.*




## Cockeysville Marble (undivided)

*Crops out only during unusually low water levels along the southeast shore of Lake Montebello, north-northeast of Montebello School where it is a very impure calcite marble containing phlogopite, feldspar, and quartz. Its presence elsewhere is inferred on the basis of topography, and its known occurrence in the Montebello aqueduct where it includes muscovitic metadolostone and medium- to coarse-grained, blue-streaked calcite marble with a variable content of phlogopite.*




## Raspeburg Amphibolite

*Generally uniform, medium- and coarse-grained, well-foliated plagioclase-hornblende gneiss (amphibolite), locally with streaks or thin layers of more feldspathic rock. Weathered surfaces commonly have a pitted appearance due to leaching of plagioclase. Local variations in grain size or in hornblende-plagioclase ratio define a layering on a scale of centimeters to decimeters.*

**REFERENCE:**

GEOLOGIC MAP OF THE BALTIMORE EAST QUADRANGLE, PREPARED BY STATE OF MARYLAND, MARYLAND GEOLOGICAL SURVEY, DATED 1979

GEOLOGY MAP LEGEND

RUMMEL, KLEPPER & KAHL